

SMUT CONTROL IN WHEAT



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Smut Control in Wheat

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INTRODUCTION

Two different smut diseases commonly attack wheat in Western Canada. One of these is known as Bunt (Stinking Smut or Covered Smut); the other is called Loose Smut. Bunt of wheat *can* be controlled by treating the surface of the seed with a suitable chemical. Loose Smut, on the other hand, *cannot* be controlled by the ordinary methods of seed treatment, that is, by applying chemicals to the surface of the seed.

The main object of this circular is to provide farmers, grain buyers and others with reliable, up-to-date, practical information on wheat smut control.

BUNT OF WHEAT

Bunt (Stinking Smut) of wheat is widely distributed throughout Western Canada. It is still an economic threat to the production of wheat in the Prairie Provinces. The average annual loss from this disease in Western Canada in recent years is estimated to be in excess of one million dollars.

Although a serious loss is sustained in marketing "smutty" grain, due to discounts, the main loss from Bunt comes from the reduction in yield. Yield losses from smut are not difficult to arrive at because the percentage of reduction in yield roughly equals the percentage of smutted heads in the field. An illustration of three heads of wheat infected with Bunt appears on the front page of this circular.

CAUSE AND IDENTIFICATION

Bunt is caused by a tiny parasitic plant called a fungus which penetrates the wheat plant during its early stages of growth. Once established, the growth of the fungus keeps pace with the growth of the wheat plant but does not materially affect its appearance. However, as the plant matures, dark smut-spore masses or smut balls are developed in the head in place of sound, healthy wheat kernels. Owing to the fact that Bunt of wheat does not destroy the chaff, farmers are often unaware of the presence of Bunt in a wheat field until the crop is threshed.

During threshing, many of the smut balls are broken and the smut spores or smut seeds become scattered over the surface of the sound grain. When grain contaminated with smut is sown without treatment, the spores germinate and penetrate the young wheat sprout as it emerges from the germinating seed. The smut parasite then continues

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to grow inside the plant and eventually forms smut balls in the head. This completes the cycle and sets the stage for a new crop of smut.

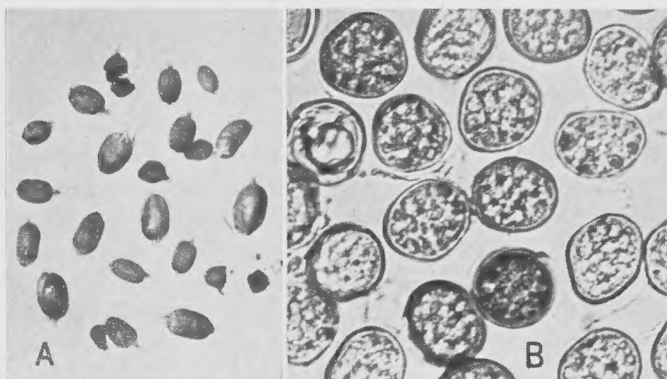


Figure 1. A—Bunt balls. B—Spores of bunt magnified 660 times.

The smut balls in Bunt of wheat are firm and compact bodies, somewhat larger than a wheat kernel. They are usually referred to as “bunt balls” (Figure 1A). It has been reliably estimated that one single bunt ball contains from six to ten million smut spores (Figure 1B).

CONTROL

The simplest and most effective method of controlling smut in any crop is to grow resistant varieties. Unfortunately, none of the wheat varieties presently grown in Western Canada is immune to Bunt. It is true, however, that some varieties, such as Redman, Regent and Selkirk, possess a good deal of resistance to this disease but under conditions favorable for smut development even these partially-resistant varieties become infected. Consequently, until varieties immune or very highly resistant to Bunt become commercially available western farmers must depend upon seed treatment to keep down the losses caused by Bunt.

Approved Treatments. Many chemicals are now available for the control of Bunt. The organic mercury compounds—Agrox C, Ceresan M, Half-ounce Leytosan, Liqui-san, Panogen, P.M.A.S., and others—are officially recommended and widely used for this purpose. These materials not only give good control of Bunt but control certain other seed-borne diseases of wheat, seedling blight for instance, which are carried over from one year to the next on or near the surface of the seed. In addition, these mercury-containing seed disinfectants offer considerable protection to the seed and seedling against soil-borne diseases during the critical period of germination and emergence. In other words, they not only *disinfect* the seed but *protect* the seed.

In recent years, a number of dual-purpose seed-treating chemicals have appeared on the market. These compounds, which contain mercury and Lindane, are recommended where wireworms as well as Bunt are to be controlled. Some of the officially recommended and more widely used dual-purpose seed disinfectants are Mergamma C, Leytosan G and Merlane. As in the case of the straight organic mercury chemicals, wheat seed should be treated with compounds containing mercury and Lindane at least 24 hours before it is sown. Furthermore, recent tests indicate that it is quite safe to treat sound, dry seed several months in advance of sowing with such dual-purpose chemicals if, after treatment, the seed is stored under cool, dry conditions until it is sown. Seed treated with a dual-purpose chemical for smut and wireworm control should not be planted too deeply. In no case should such treated seed be sown deeper than 4 inches.

Besides the mercury-containing chemicals mentioned above, a number of non-mercurial compounds are now available for use as cereal seed disinfectants. Some of the non-mercury compounds recommended for Bunt control are: Anticarie, Bunt-no-More, Bunt-Cure, No-Bunt and Tritisan C. Although these chemicals give effective control of Bunt they are not effective against other seed-borne diseases of wheat. Furthermore, they do not provide any protection against soil-borne diseases. They are recommended for wheat only. They should not be used on oats, barley, rye or flax.

Other Treatments. The practice of steeping or sprinkling seed with such chemicals as formaldehyde (Formalin) and copper sulphate (Bluestone) is no longer recommended for the treatment of wheat seed. Treatment with these chemicals is likely to cause rather severe seed injury and to result in thin, weak field stands. Furthermore, treatment with formaldehyde will neither control such seed-borne diseases as seed rot and seedling blight nor provide any protection to the seed and seedling against soil-borne diseases. On no account should frost-damaged, mechanically-injured, tough or damp grain be treated with formaldehyde.

How and When to Treat. To obtain the best results from any seed treatment the seed should be dry (not tough or damp), and of good quality. The seed should not be heavily contaminated with smut. Wheat seed that is heavily infected with Bunt should be discarded and replaced by Registered or Certified seed, or any other seed stock that is known to be free or relatively free of smut.

Before treatment seed should be thoroughly cleaned. Passing it through a cleaning mill will not only remove trash, weed seeds and most of the bunt balls, but many of the smut spores as well. The use of

dirty, uncleaned seed is a barrier to success in controlling smut by seed treatment.

For best results it is necessary to apply the right amount of an organic mercury disinfectant to wheat seed. An overdose of the chemical may injure the seed, while too little will not give good smut control. The directions given by the chemical manufacturer, particularly with respect to dosage (rate per bushel of seed) should be strictly followed.

The organic mercury seed disinfectants are most effective when they have been in contact with the seed for some time before planting. Wheat seed should, therefore, be treated at least 24 hours before seeding. *Don't plant seed immediately after it has been treated.* Although seed may be treated any time during the Fall and Winter months, the best control of Bunt is likely to be obtained when the interval between treating and planting does not exceed 8 weeks. Once treated, however, the seed should be stored in a well ventilated, dry place until it is sown.

Most of the modern organic mercury seed disinfectants may be applied either as dusts, concentrated solutions (a thick paste or slurry), or as liquids, depending upon the type of seed-treating equipment available. However, no matter what chemical is used, nor in what form it is used, a thorough mixing of chemical and seed is essential. Every kernel should be evenly coated with the chemical.

Precautions. One disadvantage of the mercury-containing seed disinfectants is that they are poisonous or toxic. Consequently, proper precautions must be exercised in handling them if discomfort or sickness is to be avoided. When treating seed be sure and wear a good respirator and, if at all possible, carry out the seed-treating operation in a well ventilated place, or out-of-doors. The precautions given by the chemical manufacturer should be followed closely.

Seed treated with an organic mercury compound is poisonous. Therefore it must not be sold for human consumption or fed to livestock. According to a recent ruling of the Board of Grain Commissioners for Canada it is a serious criminal offence to deliver such treated grain to an elevator. Providing it is properly labelled and stored, treated seed can be held over and used the following year. If possible, however, surplus treated seed should be sold as seed, or sown for green feed.

SEED TREATMENT PAYS

Laboratory tests made by the Line Elevators Farm Service on thousands of farmers' seed samples of wheat indicated that more than one-half of the wheat seed stocks used in the Prairie Provinces in 1951, 1952 and 1953 was contaminated with Bunt, and required treatment. Our advice to farmers, therefore, is as follows. Unless your wheat seed

has been examined at a seed testing laboratory and found to be sound and free from spores of Bunt (Stinking Smut), treat it with an officially-approved seed disinfectant. Seed treatment is good, inexpensive crop insurance. No other farm practice can return so much for such a little investment per acre.

Farmers who are in doubt as to whether or not their own wheat seed is contaminated with spores of Bunt are invited to avail themselves of the *free* smut tests offered by this Department through its associated Line Elevator Agents.

LOOSE SMUT OF WHEAT

Loose Smut of wheat, though widely distributed throughout the Prairie Provinces, is not generally considered as economically important as Bunt (Stinking Smut). Nevertheless, the introduction in recent years of certain new varieties that are susceptible to Loose Smut, such as the common spring wheat variety Lee and the durum wheat varieties Carleton and Stewart, has increased the prevalence of, and losses from, this disease in Western Canada.

CAUSE AND IDENTIFICATION

Loose Smut of wheat is caused by a parasitic fungus which produces dark masses of smut spores in the heads of the plants. The black smutty heads become conspicuous as soon as they emerge from the "boot". Once the head is exposed, however, the smut spores are blown away by the wind and, before long, all that remains of the head is a bare central stalk. Loose Smut is easier to recognize in the field than Bunt (Covered or Stinking Smut) because the spikelets and chaff of infected heads are completely destroyed and replaced by the smut (Figure 2).

Loose Smut infects the floral parts of the wheat plant. Its spores are scattered over the crop by wind at flowering time. Any spores that happen to come in contact with the flowers of healthy plants germinate right away and infect the young developing grain. The smut fungus then remains dormant, unseen, and apparently harmless, deep inside the seed until the grain is sown. When such infected seed is sown, however, the fungus comes to life and keeps pace in growth with the growth of the young wheat plant. Finally it reaches the forming head, and destroys certain parts of it, replacing them with the black spore masses which become visible and exposed as soon as the head comes out of the "boot". After the smut spores have been exposed for a few days they are blown away by the wind to infect the healthy heads of the new crop. Year after year this cycle of development takes place.

CONTROL

Loose Smut of wheat is carried over from one year to the next not on the *outside* of the seed but deep *inside* the seed. It is obvious therefore that Loose Smut *cannot* be controlled by merely disinfecting the surface of the seed with a chemical. No, to control Loose Smut it is necessary to kill the fungus within the grain. This can be done with a suitable seed-soaking treatment the best known of which is the "Hot Water" treatment. However, as few farms have the necessary equipment or facilities for effectively carrying out this treatment, and as there is risk of injuring the grain, the hot water method is recommended only where small lots of seed are to be treated.

If properly done, the hot water treatment will eliminate Loose Smut from wheat seed. The usual method involves soaking the seed 4 to 12 hours in unheated water, and then dipping it in water at 125°F. for 2 minutes. This is followed by a 10-minute dip in water at a temperature of 129°F. Immediately after treatment the seed is cooled and dried.

Control of Loose Smut also has been obtained by soaking the seed in water for 6 hours at room temperature, and then soaking it from 44 to 48 hours in a weak solution of the commercial seed-disinfecting chemical called Spergon. Seed treated with Spergon must be dried rapidly and then protected from freezing until sown.

Farmers who wish to use the "Hot Water" or "Spergon" treatments should get the latest information on these methods from their Provincial University, or nearest Dominion Laboratory of Plant Pathology (Edmonton, Saskatoon, or Winnipeg).

Use Smut-Free Seed. By far the best method of dealing with Loose Smut is to avoid it by selecting seed from crops that are known to be free or relatively free of this disease. The use of Registered or Certified seed, or seed from a segregated smut-free seed plot, will enable any farmer to keep his wheat crop practically free of Loose Smut.



Figure 2. Loose smut of wheat. Normal, smut-free head in centre.

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Additional copies of this circular, or of circulars dealing with the control of smut in oats and barley, may be obtained from local grain buyers of any of the elevator companies listed above, or from the Line Elevators Farm Service, Grain Exchange Building, Winnipeg, or Herald Building, Calgary.